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Understanding Atypical Emotions Among Children with Autism

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Children with autism are said to be poor mind readers: They have a limited understanding of the role that mental states play in determining emotions and behavior. In this research, 23 high-functioning children from the autistic spectrum (*M* age 9 years 3 months), 42 6-year-old controls, and 43 10-year-old controls were presented with six emotion-evoking stories and they were asked to explain protagonists' typical and atypical emotions. In the case of typical emotions, as expected on the basis of the mindblind hypothesis, children from the autistic spectrum gave few mental state explanations, referring to fewer than even the 6-year-old control group. However, in the case of atypical emotions, the autistic group performed as well as the 10-year-old controls. Their explanations for the atypical emotions demonstrate that children from the autistic spectrum indeed have the capacity to mind read (with respect to both desires and beliefs), although they do not always use this capacity in the same way as normally developing children. It is argued that the mind-reading capacity of high-functioning children from the autistic spectrum might be basically intact; unused in everyday circumstances but not necessarily defective.

KEY WORDS: High functioning children with autism; theory of mind; emotions, multiple complex developmental disorder.

INTRODUCTION

Emotions play an important role in our daily contact with others. We, for example, strategically display emotions to influence other people's behavior. Irritation or happiness can be shown in reaction to the behavior of others and can even be used to influence someone's future actions. In return, we also react to the emotional responses of others, and we may even anticipate these and adapt our behavior accordingly. A well-known characteristic of children with autism is the lack of emotionally based contact with others (Kanner, 1943). Children with autism fail to apply strategic manifestations of emotions. For example, in comparison to the nonautistic, their facial expressions are less expressive or inappropriate for the situation, they make fewer gestures that express an emotional state (Yirmiya, Sigman, Kasari, & Mundy, 1992), and they use less emotionally based intonation in their voices (Ricks, 1979). This raises the question of the extent to which children with autism have an understanding of the subjective character of emotions. In other words, do they understand that emotions are caused by someone's wishes and by someone's ideas about reality and not by reality itself? Or, in line with the concepts that are used within so-called theory-of-mind (ToM) research (e.g., Mitchell, 1996; Wellman, 1990): Do children with autism understand the causal relationship between *desires* (wishes, hopes, dreams, ambitions, goals, etc.) and emotions, and between *beliefs* (ideas, convictions, expectations, thoughts, notions, etc.) and emotions?

It is difficult to fully understand the emotions of other people on the basis of one's own desires and beliefs, as these frequently differ from those of others. It appears that it is easier for young children to accept that different people can have different desires, than to accept that different people can have different beliefs

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about reality. For example, normally developing children spontaneously refer to others' desires that deviate from their own at an earlier age than they refer to divergent beliefs (Bartsch & Wellman, 1995). In the development of normally developing children, the understanding of the causal relationship between desires and emotions precedes the understanding of the causal relationship between beliefs and emotions (Harris, 1989). Children with autism show this pattern even more strongly: In the case of desires, they perform as well as a control group, but they barely refer to beliefs in their explanations of others' emotions (Tager-Flusberg, 1992). Also other findings demonstrate that children with autism have a better understanding of the causal relationship between desires and emotions, than between beliefs and emotions (Baron-Cohen, 1991).

Children's understanding of beliefs is frequently investigated by the so-called false-belief paradigm (Baron-Cohen, Leslie, & Frith, 1985; Perner, Frith, Leslie, & Leekam, 1989). In a false-belief task, the protagonist has an incorrect mental representation of reality, a false belief, whereas participants know this. Children with autism find it difficult to understand that, under such circumstances, they need to predict another's emotion based on the other's false belief, and not on their own knowledge about the situation. It is suggested that responses on this kind of task are influenced by verbal ability (Boucher, 1996) and that the poor performance of children with autism (and children with Asperger syndrome) are partly the result of their poor verbal abilities. Nevertheless, even when matched on a verbal index, differences with normally developing children remain evident (see, e.g., Dahlgren & Trillingsgaard, 1996). Moreover, children with language impairment but not autism have little difficulty with false belief tasks (Perner *et al.*, 1989, Leslie & Frith, 1988).

These deviant results of children on the autistic range are frequently explained by a fundamental deficit that results in "mindblindness" (Baron-Cohen, 1995; Carruthers, 1996). Mindblindness implies that children live in a world in which mental activities, such as dreaming, hoping, thinking, and wanting, are not recognized and play no role. Consequently, they also lack the ability to attribute mental states to others. Beliefs are mental representations of an objective reality and children with autism appear not to understand that different people can have different perspectives on this objective reality. However, the prediction or explanation of other people's emotions based on desires does not necessarily require the attribution of a mental state, since desires do not conflict with objective reality. Indeed, research shows that children on the autistic spectrum understand desires to a certain extent, what they lack is an understanding of beliefs (Tager-Flusberg, 1992).

In this paper, we investigate the mindblindness hypothesis as an explanation for deifficts in theory-of-mind ToM tasks found in children from the autistic spectrum. Participants are presented with stories in which mental state explanations are necessary: Children are asked to explain atypical emotions. Typical emotions can easily be explained by situational factors, as these usually reflect scripted knowledge. For example, the question why someone is *happy* when receiving a present evokes responses such as "because he received a present!" Such an answer, however, is not sufficient to explain atypical emotions. When asked why someone is *angry* when receiving a present, the answer "because he received a present" is inadequate; an angry response is not typical in this situation. The atypical emotion cannot be explained in terms of the situation and can only be explained by referring to the protagonist's mental states such as their desires (e.g., "He doesn't like presents") and their beliefs (e.g., "He thinks that it will be something stupid"; Rieffe, 1998).

At this point a distinction must be made between typical and atypical emotions. Children with autism were shown to have a good understanding of typical emotional scenarios (Capps, Sigman, & Yirmiya, 1995) and the expectation is that normally developing children, as well as children with autism, would frequently refer to situational determinants in the case of typical emotions. However, when asked to explain atypical emotions, it was found that normally developing children no longer restricted themselves to situational explanations (Rieffe, 1998). From their point of view, these cases asked for an explanation in terms of mental states. However, the mindblind hypothesis predicts that children with autism will not refer to mental states when explaining atypical emotions. If this perspective is correct atypical emotions should be largely misunderstood by children on the autistic spectrum, evoking responses such as "don't know" or "it can't be."

In most of the research discussed so far, participants were diagnosed with "Kanner" autism (Kanner, 1943) or with the Asperger syndrome (Wing & Gould, 1979). Our expectations apply foremost to these clinical groups. Children with Pervasive Developmental Disorder Not Otherwise Specified (PDDNOS), however, are also frequently included in the autistic spectrum (van Leeuwen & Stockmann, 1996). Although authors are not very clear on this issue, it seems as if autism researchers often include these children. A complicating factor is the probable heterogeneous character of the group with

PDDNOS. When we took both the social and the cognitive difficulties into consideration, the subgroup Multiple Complex Developmental Disorder (MCDD) see Buitelaar & van der Gaag, 1998; Cohen, Paul, & Volkmar, 1986) had an obvious affinity. MCDD refers to a broad range of early-onset disorders, that can mainly be distinguished from PDDNOS by (a) thought disorders, manifested as unusual thoughts and difficulties in separating fantasy and reality; and (b) disturbances in affect regulation, manifested as unusual outbursts of anger and/or panic (Cohen *et al.*, 1986). Van der Gaag (1993) argued that autism, the Asperger syndrome, and MCDD could be placed on one continuum. Our research involves high-functioning children from a broad autistic spectrum.

METHOD

Participants

Twenty-three children in residential care with a pervasive disorder from the autistic spectrum (*M* age 9 years 3 months; range 5–8 to 11–8; 19 boys/4 girls) participated in this study. Based on DSM-IV (American Psychiatric Association, 1994) criteria, the group consisted of 2 children with autism, 3 children with the Asperger syndrome, and 18 children were diagnosed with PDDNOS. Of these 18 children, 6 were diagnosed with MCDD, based on the criteria of Cohen *et al*. (1986) (Table I). The mean verbal IQ of the participants (WISC-R) was 90 *SD* = 17); the verbal IQ of one child was unknown.

Table I. Criteria of Multiple Complex Developmental Disorder (MCDD)[a]

At least 2 criteria form A, B, and C are present;

A. Affective State and Anxiety
1. Generalized anxiety, diffuse tension, or irritability
2. Fears and phobias
3. Panic episodes, terror, or "flooding" with anxiety
4. Episodes of behavioral disorganization
5. Emotional lability

B. Social Interaction
1. Social disinterest, detachment, avoidance, or withdrawal
2. Inability to initiate or maintain peer relationships
3. Disturbed attachments to adults

C. Thought Disorder
1. Thought problems, including irrationality, magical thinking
2. Confusion between reality and fantasy
3. Perplexity and easily confused
4. Delusions, paranoid preoccupations

[a] Based on Cohen, Paul, and Volkmar, 1986.

The children from the autistic group were given two standard false-belief tasks. The first, Wimmer and Perner's (1983) standard false-belief task, asked children to predict the protagonist's *action.* The second, Harris, Johnson, Hutton, Andrews, and Cooke's (1989) false-belief task, asked children to predict the protagonist's *emotion.* All children passed both tasks, except for one child (diagnosed with autism) who passed the action-prediction task but failed the emotion-prediction task.

The same experiment had already been carried out with a sample of 42 6-year-olds (*M* age 6–3; range 5–9 to 7–2) and 43 10-year-olds (*M* age 10–4; range 9–8 to 10–11). These children were recruited from primary schools in the suburbs around Amsterdam. Half of these participants were male and half were female. Although the composition of these control groups did not match the clinical group precisely in terms of age and gender, roughly speaking the oldest control group matched the clinical group in terms of chronological age, whereas the youngest group can be considered as a control group with an equal (or even lower) level of verbal abilities.

Material

The material consisted of six stories (Table II) that described emotion-eliciting situations. Two stories were designed to provoke a positive emotion, two stories were designed to provoke fear, and two stories were designed to provoke sadness or anger. Although sadness and anger are conceptually different emotions, it is virtually impossible to design stories in which anger is an appropriate reaction, but sadness is not, and vice versa. An event could cause an angry reaction when one concentrates on the process or on the actor. Yet, the same event might cause sadness, when one focuses the nature of the outcome (Stein & Levine, 1989).

After hearing each story, participants were asked how the protagonist would feel and why (Questions 1 and 2). If participants failed to identify an emotion, they were asked "Do you think [name protagonist] feels happy, sad, angry, or afraid?" The order of the suggested emotions was randomized. Once participants had predicted and explained an emotion, the experimenter said that the protagonist felt differently and named an atypical emotion. The atypical emotions (happiness, anger, or fear) were fixed (see Table II). The experimenter asked participants to explain the atypical emotion (Question 3). When participants predicted an unexpected emotion, the experimenter continued with an emotion that was opposite to the one named by the child, because we did not want to discourage participants. Female protagonists were used for stories that

Table II. Six Stories with Typical and Atypical Emotions

Story content	Typical	Atypical
1. Boy receives present from his mother	Happy	Angry
2. Girl goes outside to play hide and seek with others	Happy	Afraid
3. Girl cannot go to the zoo, but has to stay at home	Angry/sad	Happy
4. Boy has a dog that is a bit ill	Sad	Afraid
5. Girl in dark house sees a person she cannot identify	Afraid	Happy
6. Girl lies in bed and hears a strange noise	Afraid	Angry

involved fear as a typical emotion in order to avoid "macho" responses (we had noticed in previous studies that many boys (of all age groups) claimed to never be afraid during introductory conversations). An example of a (sadness/anger) story is:

> This is Linda. Linda's father and mother had said that they would go to the zoo. But now Linda's mother says that they cannot go and that they will have to stay at home. How does Linda feel now she hears that she won't go to the zoo, but has to stay at home? (1) And why does Linda feel. . . ? (2)
>
> Yes, I would have thought so too. But Linda does not feel [emotion given by the participant]. Linda feels *happy* now she won't go to the zoo and will stay at home. How come Linda feels happy? (3)

Procedure

Participants were tested in a quiet room in one session of approximately 10 minutes. To make participants familiar with the emotional concepts that would be used in the stories, they were asked if they sometimes experienced happiness, sadness, anger, and fear, and if they could give an example of such an occasion. The experimenter helped children who found it difficult to provide examples. For example: "When it's your birthday, do you feel happy then? Okay, and could you think of something else now?" No further prompting was given during the presentation of the six emotion-eliciting situations. The order of the six presented stories was randomized. Sessions were tape-recorded.

Scoring

To ascertain the extent to which children attributed mental states to the protagonist in their emotion explanations, responses were assigned to one of the following categories:

Fact Beliefs. This category was applied when participants referred to the protagonist's beliefs about the situation. For example Linda is happy now she won't go to the zoo ". . . because she thinks that she will do something else."

Desires & Preferences. This category was applied to answers referring to the protagonist's desires or preferences. For example, Linda is happy ". . . because she doesn't like the zoo, she doesn't like the animals" or "because she wants to stay home and play with her cat." Value beliefs, that is, beliefs that do not refer to reality but to someone's preferences, were also included in this category.

Situational. Answers that only elaborated on the situation or referred to another situation without reference to a protagonist's mental state fell into this category. For example: "because she has already been there."

Don't Know. Responses of children that failed to explain the protagonist's emotion fell into this category.

Missing. This category was applied if (a) the participant had not predicted the typical emotion, or (b) the answer was missing on the tape. The responses of 4 participants (1 child with autism and 3 6-year-olds) were excluded from further analyses, because they had two missing values on one emotion cluster (two happiness, anger/sadness, or fear stories). When participants had one missing value per emotion cluster, the remaining score was included in the analysis.

Note that children from the control group and from the clinical group rarely responded with inappropriate or unreasonable explanations (the above examples in the scoring section are responses given by the clinical group). Nevertheless, there were some differences that can be considered as indicative for the different groups: Children from the control groups frequently referred to social interactions (Linda was happy not to go to the zoo, because she wanted to play with a friend), whereas children from the autistic spectrum thought that Linda would do something solitary. Only one child reacted in an unusual way, he argued that Linda was happy not to go to the zoo because she was an animal killer. It might not be surprising that this child was diagnosed with MCDD.

Note also that the categories for beliefs and desires were not exclusive, as the response to the story in which a girl hears a strange noise while lying in bed "Because she *thinks* it is a burglar and she *wants* to sleep" refers to a desire and a fact belief. Responses were then assigned to both categories. This was the case for 11, 26, and 43 responses by the group with autism, 6- and 10 year-olds, respectively. Two raters coded all responses. The interrater agreement was 97% and disagreements were resolved by discussion.

RESULTS

Typical Emotion Predictions

The expected or typical emotion was predicted for 92% of the responses (Question 1). The typical emotion was more often correctly predicted by 10-year-olds (96% correct) than by 6-year-olds (90% correct) and children from the autistic spectrum (90% correct). One story, in which a girl goes outside to play with other children, evoked some unexpected emotion predictions. Twelve 6-year-olds, six 10-year-olds, and six children from the clinical group did not predict that the girl would be happy, but angry, sad, or scared. The other stories nearly always evoked an expected emotion prediction. In general, the typical emotions were reasonably well predicted.

Explanations for Typical and Atypical Emotions

The expectation was that children from the autistic spectrum would attribute fewer mental states when explaining the protagonist's (both typical and atypical) emotion than normally developing children. Table III shows the total number of mental state attributions, divided by the number of stories (6). It can be seen that the clinical group referred less to mental states when asked to explain typical emotions than the control groups. In contrast to the mindblind hypothesis, however, they gave more mental state attributions than the control groups when asked to explain atypical emotions. It can be seen that all groups attribute more mental states when asked to explain atypical emotions than typical emotions, but this difference is largest for the clinical group. A 3 (Group) × 2 (Mental State: desire vs. belief) × 3 (Emotion: happiness, anger/sadness, fear) × 2 (Type: typical vs. atypical) analysis of variance with repeated measures on the last three factors confirmed a main effect for Type, $F(1, 101) = 20.75$, $p = .000$, and an interaction for Group × Type, $F(2, 101) = 3.87$, $p = .024$. Post-hoc analysis of variance confirmed a difference for the mental state attributions between the three groups in the typical condition, $F(2, 101) = 5.00$, $p = .008$, but not in the atypical condition. Note also that, contrary to our expectations, responses of children from the autistic spectrum were never scored in the category "don't know."

Table III. Proportion of Mental State Attributions of Six Stories as a Function of Group × Typical or Atypical Emotion Explanation

Group	*n*	Typical	Atypical
Children with autism	22	.24	.56
6-year-olds	39	.39	.47
10-year-olds	43	.48	.55

A further division suggests an equal pattern of responses among the three subgroups of children from the autistic spectrum (Table IV). All groups performed relatively poorly for typical emotions and relatively well for atypical emotions. This pattern appears most strongly for children with PDDNOS and seems unrelated to children's verbal IQ: The mean VIQ of the PDDNOS group (90) is lower than that of the autistic/Asperger group (104), but higher than that of the MCDD children (81). Note, however, that the small samples preclude testing these groups separately and that these results are only indicative.

Besides the effects for Type and Group × Type, it appears that all interactions between Mental State, Type, and Emotion are statistically significant: Mental State × Type, $F(1, 101) = 27.06$, $p = .000$; Mental State × Emotion, $F(2, 202) = 106.06$, $p = .000$; Type × Emotion, $F(2, 202) = 13.69$, $p = .000$; (and (relatively weak) interaction of Mental State × Type × Emotion, $F(2, 202) = 3.14$, $p < .05$. Table V shows the proportion of desire and belief attributions as a function of Type and Emotion. Apparently, children's response to fear differs from their response to happiness and anger/sadness. Fear evokes many belief attributions and only a few desire attributions. The other emotions show an opposite pattern. Moreover, belief attributions occur less for atypical than typical fear, whereas belief and desire attributions increase in the case of happiness and anger/sadness. It is argued in the Discussion that these differences are probably caused by the anticipating character of fear. More important, however, is the fact that mental state and emotion show no interaction with Group, implying that children from the autistic spectrum attribute as many beliefs and desires as normally developing children. Also when we looked at the three subgroups of children from the autistic spectrum, there were no apparent differences between their mental state explanations and those of the control groups for fear, anger/sadness, or happiness.

DISCUSSION

Earlier findings showed that children from the autistic spectrum sometimes explain other people's emotions in terms of desires but rarely in terms of beliefs (Tager-Flusberg, 1992). Our research confirms this finding with regard to typical emotions, but not with regard to atypical emotions. In the case of typical emotions (happiness on receiving a present), our

Table IV. Proportion of Mental State Attributions for Typical and Atypical Emotion Explanations per Subgroup from the Autistic Domain

Subgroup	*n*	*M* age	VIQ	PIQ	Typical	Atypical
Autism/Asperger	4	8-0	104	98	.34	.57
MCDD	6	9-4	81	83	.33	.41
PDDNOS (MCDD excluded)	12	9-6	90	89	.15	.64

Table V. Proportion of Desire and Belief Attributions for Typical and Atypical Emotion Explanations ($n = 104$)

	Belief attributions			Desire attributions		
Emotion	Happiness	Anger/sadness	Fear	Happiness	Anger/sadness	Fear
Typical	.11	.07	.44	.20	.21	.06
Atypical	.18	.12	.28	.28	.47	.12

autistic participants with a mean age of 9 years attributed even fewer mental states (desires and beliefs) than a much younger control group of 6-year-olds. However, in the case of atypical emotions (e.g., anger on receiving a present), the clinical group performed as well as a 10-year-old control group of normally developing children. Thus, children from the autistic spectrum understood atypical emotions in terms of the protagonist's mental states: Both beliefs and desires were attributed to the same extent as in normally developing children. Like their peers, children from the autistic spectrum explained, for example, that Michelle was happy to observe that there was someone in the dark living room (atypical emotion in a prototypical fear situation), "because she *knows* that it is her father or mother." Note that the content of these responses was as appropriate as those of the control group. In conclusion, explanations of prototypical emotions suggest a deficit in the mind-reading capacity of children from the autistic spectrum. Yet, they perform as well as a normally developing peer group in their explanations of unexpected, atypical emotions.

Not surprisingly, it was shown that the ratio of desire and belief attributions differed per emotion domain, for all groups. Happiness, anger, and sadness are predominantly related to the outcome of a situation. When one attains or maintains a desired state, happiness is aroused, whereas anger or sadness is aroused when one feels frustrated in the achievement of a desired state (Frijda, 1986; Stein & Levine, 1989). Desire attributions increased when participants were asked to explain atypical happiness, anger, or sadness. Fear, by contrast, evoked many belief attributions. Fear is experienced as a threat to one's security or safety (Izard, 1991). It is an emotion that anticipates a possible outcome: One's beliefs about future events can evoke fear. The finding that participants referred more to beliefs in the case of typical than atypical fear was unforeseen. This is probably due to an unexpected difference in story types. The typical fear stories appealed to fear for the unknown (an unknown person or noise in a dark environment), whereas the atypical fear stories were more focused on a specific situation (fear because one's dog is ill and fear because one goes outside to play with others). Especially when children had to explain typical fear, the protagonist's lack of knowledge about the situation was perceived as important and this evoked relatively many belief attributions: "She doesn't know what it is."

Comparisons among the response patterns of the three subgroups (Autism/Asperger, MCDD, and PDDNOS) support the idea that the cognitive functioning of the MCDD and PDDNOS groups is closely related to that of the Autism/Asperger group (Cohen *et al.*, 1986). As yet, we have no available explanation for our finding that the PDDNOS children's responses were even more pronounced than those of the other groups. Overall, we may conclude that our data demonstrate that children from the autistic spectrum do have a mind-reading capacity, but they simply do not apply this spontaneously to the same extent as normally developing children. These findings contradict the mindblind

hypothesis, which holds that children with autism do not acknowledge mental states as an explanation for another's emotion or (emotional) behaviour.

The fact that children from the autistic spectrum produced mental states in our research, whereas this basic capacity is hardly manifest in other findings (Tager-Flusberg, 1992), might be explained by a combination of factors. First, unlike typical emotions, atypical emotions cannot easily be rationalized by purely situational explanations. The answer that someone is happy because she is not going to the zoo anymore (atypical emotion) is not sufficient, because it puzzles the listener and evokes more questions. A more suitable solution for these atypical emotions is to address the subjective element of emotions (Rieffe, 1998): Probably, the protagonist wanted to do something else, or she believed that her mother had made a joke. The fact that atypical emotions strongly appeal to normally developing children's appreciation of mental states as the cause of emotions seems to have had an effect on children from the autistic spectrum as well. Moreover, an explanation in terms of the situation was not encouraged, since children's mainly situational explanations for the protagonist's typical emotions were always rejected "I would have though so too, but. . . ." Children might have interpreted such a response as a correction, as if they were expected to search for other options in their explanation of atypical emotions.

Second, it is also argued that children with autism have a weak drive for *central coherence* (Frith, 1989; Happé, 1994) or a *generative impairment* (Jarrold, 1997). The central coherence hypothesis states that these children cannot derive the necessary information from a situation to assemble a context-dependent meaning. Consequently, they might react to details in a situation that others perceive as unimportant (see Weeks & Hobson, 1987). For example, children with autism refer to many details when they are asked to describe a drawing depicting a car accident ("here is a stop sign," "someone is lying on the road," "here is a car"), but they do not refer to the accident. The generative hypothesis states that the required internal representations are not readily accessible for children with autism. Importantly, both the central coherence hypothesis and the generative hypothesis predict that the performance of children with autism improves if they are told where to direct their focus. This is exactly what the first part of each story might have done. The first two questions in our stories: "How does she feel?" and "Why does she feel. . . ?" focused children on the protagonist's emotion and showed children that the experimenter was interested in an explanation of this emotion. Thus, by the time they were asked to explain the atypical emotion, they had already concentrated on the protagonist's experience of the situation. In other words, the first emotion explanation might have caused a priming effect. Other findings strengthen the idea that the performance of children with autism improves when they are appropriately prompted. For example, their pretend play (symbolic and functional) is found to be impaired in spontaneous situations, but not in structured situations in which the idea for pretence is specified (Jarrold, 1997; Jarrold, Boucher, & Smith, 1993).

The question is why, if they have the capacity to mind read, children from the autistic spectrum hardly seem to apply this capacity. Do they not understand spontaneously that mind reading can help them in their contact with others in everyday life? Or do they not appreciate the advantage of mind reading? When we observe high-functioning children from the autistic spectrum in their daily life, many (but not all) appeared to lack curiousity for others, unless they have a direct need to obtain something from another person. Their play is solitary (or someone else is allowed to participate on their terms) and they do not even look, for example, when another child falls over and hurts him or herself. Yet, as soon as something unexpected or something exciting happens, many high-functioning children with autism know where to find a caretaker to hold their hand.

It has been argued that stress and anxiety play a crucial role in many behavioral problems of children with autism (Groden, Cautela, Prince, & Berryman, 1994). There are several factors that might be the cause for a higher level of stress: their poor ability for central coherence (Frith, 1989; Happé, 1994), perceptual hypersensitivity (Bettison, 1996; O'Neill & Jones, 1997), or an information-processing disorder (Minshew, Goldstein, & Siegel, 1997) might all cause children from the autistic spectrum to have difficulties with handling too many stimuli simultaneously. For example, when one cannot interpret a situation because one does not understand its context-dependent meaning, one is bombarded with seemingly meaningless stimuli and is unable to arrange these hierarchically as other people do. Too much information, or too many stimuli simultaneously which cannot be properly processed, might cause anxiety or stress. It could be argued that children from the autistic spectrum try to avoid situations that cause an arousal of their level of stress, and consequently, they try to avoid social interactions with others. In that case, their mind-reading capacity under everyday circumstances would be basically intact but unused, and hence

perhaps underdeveloped but not necessarily defective as suggested by the mindblind hypothesis.

The idea that the level of stress plays a crucial role in their daily functioning would also explain, for example, why many children with autism—also high-functioning children—can be observed to intensify their repetitive behavior or self-stimulation and close off their interactions with others even more in times of pressure. It seems as if the extent to which they tolerate external information is related to the level of tranquility of the situation. The hypothesis that children from the autistic spectrum only have room to mind read when their level of stress is reduced is recognizable for many of us: Don't most people totally lose their interest in others the moment they are severely bothered by their own problems?

It is important to note that this difference in approach also leads to different ideas on how children from the autistic spectrum can be stimulated, for example, in their performance of ToM tasks. Based on the mindblind hypothesis, one would expect them to improve when they are taught different techniques to execute ToM tasks. Research in this area showed, however, that their improved performances on one kind of task were not applied to tasks in other domains when children received no training (Hadwin, Baron-Cohen, Howlin, & Hill, 1997). The unused mind-reading capacity hypothesis, on the other hand, predicts that children from the autistic spectrum have theory of mind capacities that remain latent, but could be revived when conditions are optimal. Enhancing the saliency for a ToM explanation proved to be effective in the present experiment. Other possibilities, for instance the introduction of personal gain—shown to be effective in normally developing 3- to 5-year-olds (Meerum Terwogt, Rieffe, Tuijn, Harris & Mant, 1999)—might have a similar effect. This suggestion is currently being investigated.

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